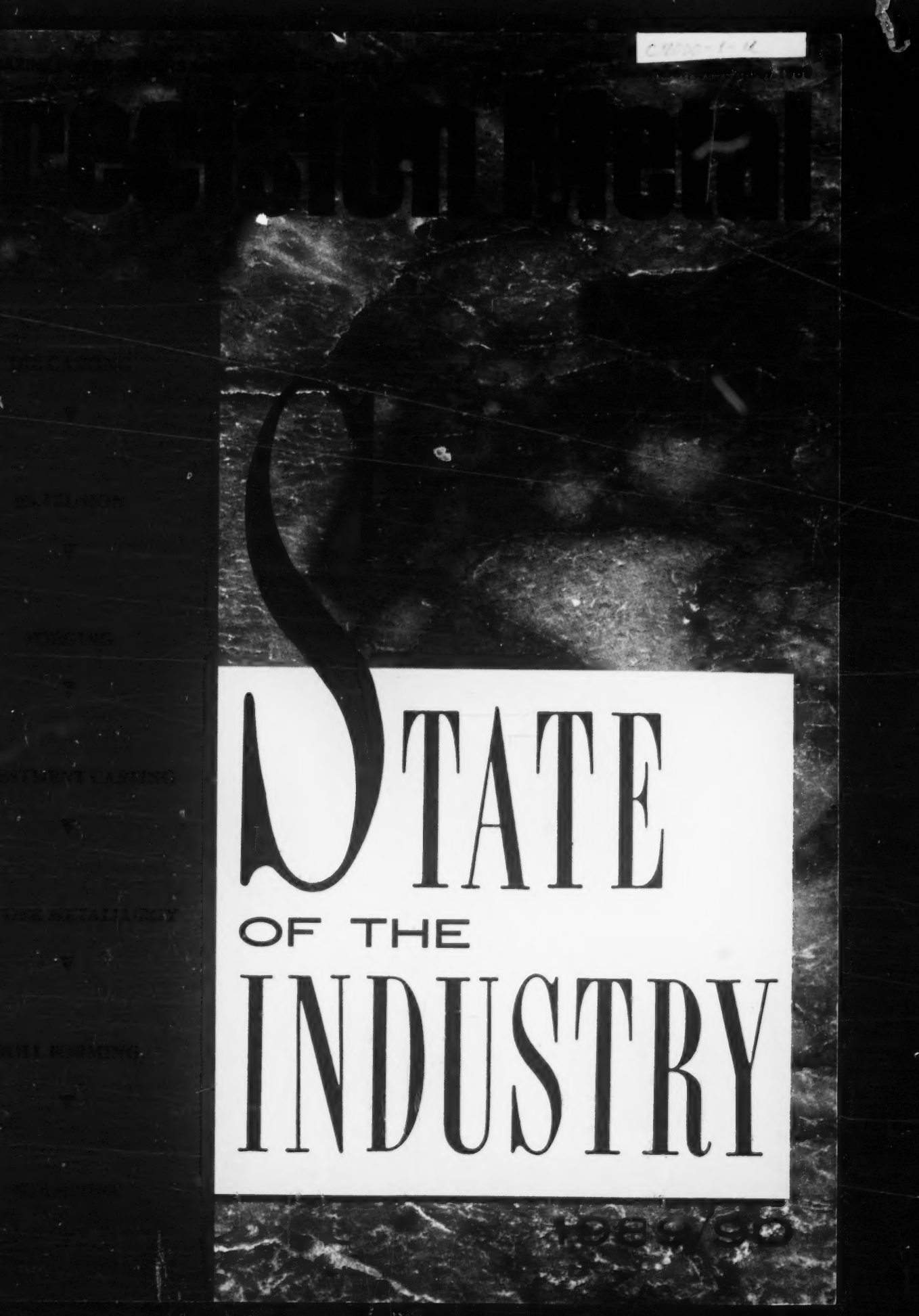
STATE
OF THE
INDUSTRY

November/December 1989 CONTENTS Volume 47 No. 9

Precision Metal

THE MAGAZINE FOR DESIGNERS AND MAKERS OF METAL PARTS

Die casting • Extrusion • Forging • Investment casting
Powder metallurgy • Roll forming • Stamping

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FEATURES

15 STATE OF THE INDUSTRY REPORT 1989/90

The state of the precision metalworking industries is reviewed in this comprehensive report. It details 1989 economic activity and provides insight into 1990. The issue is conveniently divided into seven metalworking sections and chock full of up-to-date statistical information on end use markets, shipments, capital equipment buying activity and forecasts.

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STATE OF THE INDUSTRY

DIE CASTING
EXTRUSION
FORGING
INVESTMENT CASTING
POWDER METALLURGY
ROLL FORMING
STAMPING

A Staff Report

1989/90

For almost two decades, PRECISION METAL has been monitoring the health of the precision metalworking industries via the *State of the Industry Report*. Within the same two decades, metalworking economic conditions have vacillated drastically from swollen backlogs and plant expansions to devastating layoffs and plant closings. The question that this report hopes to answer for the reader is where we stand today, on the brink of the next decade, and where we will stand in 1990.

As supported by the graph included on this page, all of the industries we cover are showing upward production trends aligned closely with growth in the Gross National Product. Shipments are running at least comparable with 1988, or in some cases slightly higher, according to industry experts we spoke with. This slight upward trend is expected to continue through next year for all except those closest to the automotive industry, as domestic car sales and production continue to slip.

Looming in the not-so-distant future is the challenge of the European Community (EC '92), as Western Europe prepares to unify as a single trade entity in 1992. However, this unification should not be looked upon as a threat by North American enterprise, but rather an opportunity as joint-venture trade agreements are a very real possibility. (PRECISION METAL will examine EC '92 in more depth in upcoming issues.)

About our survey

The following pages contain the results of a massive survey and research effort conducted annually by this magazine. We have compiled the latest government, trade association, and forecast firm statistics and combined them with our own survey of thousands of metalworking companies to paint an economic picture of the industries we serve.

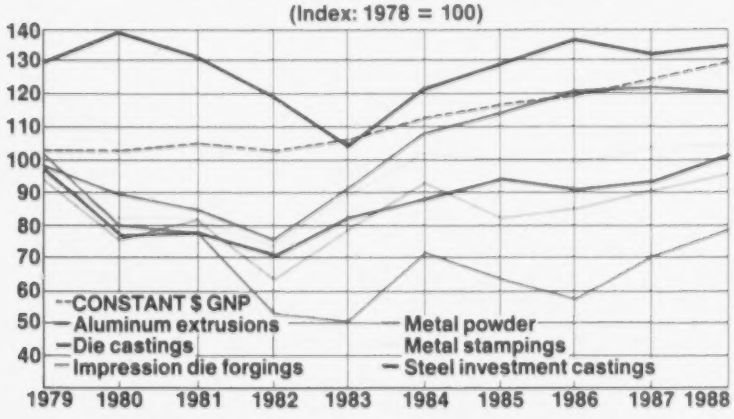
With each issue of this annual report, our practice has been to expand both the base we survey and the information we publish. This year is no exception. We sent out about 2000 *more* surveys this year than in 1988 and achieved an average rate of return of 15% per metalworking process. We asked our survey candidates to make more comparisons of 1988 to 1989 in terms of shipments and capital equipment purchases to make this a more comparative, and therefore, more useful report.

For a clearer picture as to who answered our survey and what specifically was reported, see the individual metalworking process sections on the following pages.

The editors

TRENDS IN METAL COMPONENT PRODUCTION

(Index: 1978 = 100)



Die castings include aluminum, magnesium, and zinc. Metal powder includes iron.
Source: U.S. Department of Commerce, Aluminum Association, North American Die Casting Association, Forging Industry Association, Metal Powder Industries Federation, U.S. Department of Labor, Leading Edge Reports, and Penton Information Services estimates.

STATE OF THE INDUSTRY

1989/90

DIE CASTING

Die casters in general are pleased with the current state of their industry, and for good reason. According to Derek Cocks, technical director of the North American Die Casting Association (NADCA), total industry sales for 1989 including the value of tooling, electroplating of zinc and other finishing processes, will be $7.08 billion, an increase of 4.0% over 1988. "Both aluminum and zinc alloy prices increased during 1989 and therefore, sales growth occurred at the expense of volume shipments which were actually slightly below 1988 levels," says Cocks.

Larry Hayes, executive vice president of NADCA, reports the direction of specific die cast metals. "Aluminum custom and captive shipments combined will decline slightly in 1989 to 1508 million pounds—a 4.3% decrease from 1988's record year. Zinc custom and captive shipments combined will decline a modest 2.7% in 1989 to 497 million pounds. Zinc die casting sales, however, increased over 13% riding on substantial increases in zinc base alloy prices.

"Magnesium die casting production for 1989," continues Hayes, "is estimated to be 16,400 tons versus 15,000 tons for 1988, a 9.3% increase. Combined custom and captive magnesium die casting sales are estimated to top $134 million in 1989."

NADCA's Early Warning

How many die cast components shipped will be shipped?

	1988	1989
Less than 100,000 lbs.	20.0%	18.8%
100,00 to 499,999 lbs.	12.0	14.6
500,000 to 999,999 lbs.	14.0	12.5
1,000,000 to 5,000,000 lbs.	38.0	37.5
Over 5,000,000 lbs.	16.0	16.7

Based on 49 respondents

DIE CASTING END USE MARKETS

Based on 52 respondents. Total may exceed 100% due to multiple answers.

HOT CHAMBER DIE CASTING MACHINES

Hot Chamber Machines (size in tons of locking force)	Total Number of Machines	Number of Machines Within Each Age Category			1989 Number of Machines to be...			1990 Number of Machines to be...		
		Less than 10 years old	10 to 20 years old	More than 20 years old	Replaced	Rebuilt	Added Capacity	Replaced	Rebuilt	Added Capacity
Under 50	120	22	47	12	1	18	5	2	17	25
51 to 100	30	10	9	5	1	3	1	-	1	2
101 to 250	65	13	21	16	1	4	3	1	6	-
251 to 400	43	2	7	19	-	1	1	-	-	-
401 to 550	28	6	11	5	-	-	-	-	-	-
551 to 700	25	1	6	15	-	1	2	-	1	1
701 to 850	5	-	-	-	-	-	1	-	-	-
851 to 1,000	1	-	-	-	-	-	-	-	-	1

Based on 33 respondents. Sum of age category may not equal total number of machines due to unknown age of machines.

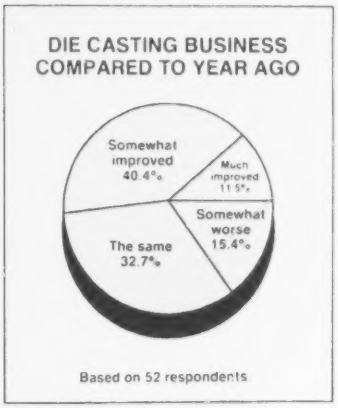
Forecast indicates 1990 will be quite similar to 1989 in terms of volume shipments. "As all industries begin to rebound in late 1990," reports Hayes, "1991 looks to be a banner year with 15% growth predicted for aluminum die casting shipments and 8 to 9% growth anticipated for zinc based alloy die casting shipments."

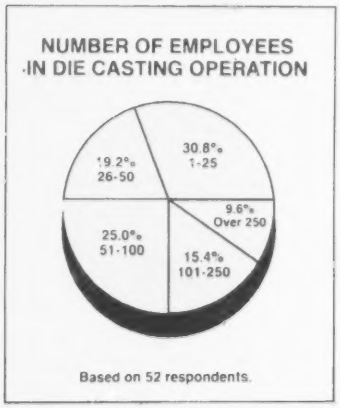
As die casters enter the next decade, most find themselves in a solid position in terms of material benefits and advanced technology. "U.S. die casters are well equipped in terms of mechanization, process monitoring and process control," observes Cocks. "We have the ability to produce state-of-the-art castings, including thin walled aluminum, as well as zinc castings requiring zero machining.

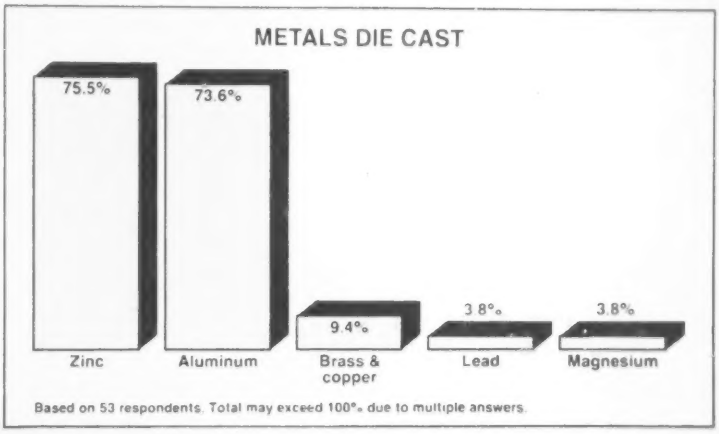
"We should make more of the fact that die cast metals have very superior mechanical properties and are environmentally good," continues Cocks. "All are 100% recycled right now, saving energy and minimizing environmental problems."

But of all the issues of concern to North American die casters, including energy, advanced materials and materials substitution, international competition, and trade, none seems as important at the moment as the skilled labor shortage. According to Russell Davis, president of Du-Wel Products, Inc., Bangor, MI, "The ability to get and train high quality people to deal with the kind of technology, quality and service requirements that our customers expect from us, is our number one concern."

John Littler, director of sales,







COLD CHAMBER DIE CASTING MACHINES

Cold Chamber Machines (size in tons of locking force)	Total Number of Machines	Number of Machines Within Each Age Category			1989 Number of Machines to be...			1990 Number of Machines to be...		
		Less than 10 years old	10 to 20 years old	More than 20 years old	Replaced	Rebuilt	Added Capacity	Replaced	Rebuilt	Added Capacity
Under 100	14	9	-	1	-	-	1	1	-	2
100 to 250	10	1	8	-	-	-	-	1	1	-
251 to 400	33	5	15	9	-	2	-	2	2	-
401 to 550	57	5	13	10	-	3	3	1	5	-
551 to 700	138	22	51	33	4	9	4	2	15	5
701 to 850	31	3	11	1	-	-	-	-	3	1
851 to 1,000	43	2	29	8	-	6	2	1	8	1
1,001 to 2,000	17	2	6	9	1	1	2	-	1	-

Based on 35 respondents. Sum of age category may not equal total number of machines due to unknown age of machines.

Littler Diecast Corp., Albany, IN, agrees. "We find that once tooling people reach a certain level, and there happens to be an opening at a major plant, they are pulled out of the job shop market. The net result is a loss of knowledge and experience for the job shop."

Littler adds his concerns regarding other positions. "We must also get to the student engineers and let them know die casting is a viable and environmentally sound process."

With the help of government grants, state school-sponsored programs and association marketing and training programs, die casters are beginning to combat a wave of people shortages in semi-skilled, skilled, technical and engineering positions. "The shortage is real, and we face a basic illiteracy in the skill areas of language, math and reading as well," says Hayes.

"NADCA has placed strong emphasis on training programs," comments Robert Marconi, president, Aallied Die Casting & Mfg. Co., Franklin Park, IL. "Also, we're going in the direction of in-plant training because this is really what we need to give the customer the service and satisfaction they require. Basically, we are not able to meet this customer demand today and it is having an adverse effect on profitability throughout the industry."

About our survey...

PRECISION METAL surveyed a sizable portion of corporate officers and technical directors involved in the die casting industry to gauge what changes have occurred this year and what are likely to occur during 1990.

A net mailing to 569 independent and captive die casting plants in the United States and Canada resulted in a 13.7% rate of questionnaire return.

Our respondents claimed 72.9% of their die casting is dedicated to independent work, while 27.1% is dedicated to captive work. These figures are based on percentage of die casting operations only.

The color graphics pictured throughout this section offer more details as to who answered our survey, how their business is doing, and what they see ahead for their companies and the industry as a whole.

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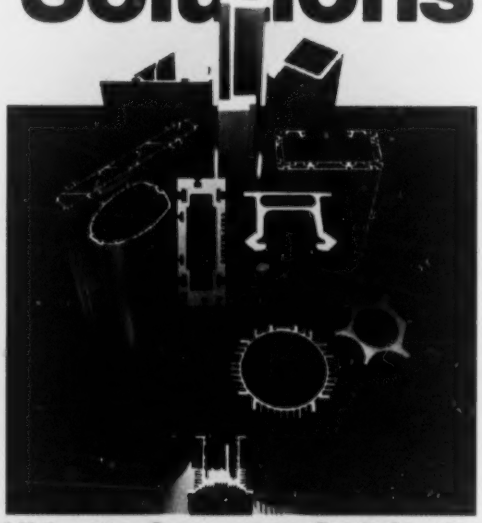

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EXTRUSION

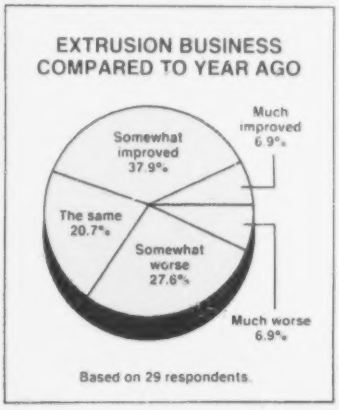
STATE OF THE INDUSTRY 1989/90

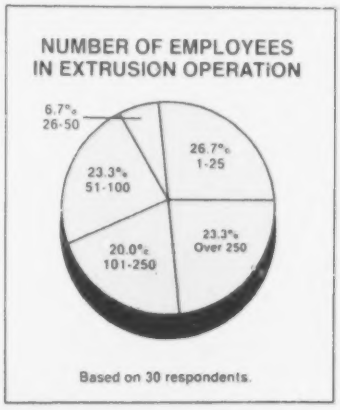
After rising every year from 1982 through 1987, shipments of aluminum extruded shapes declined in 1988 to 2.423 billion pounds — down 2.4% from 1987 levels, according to the U.S. Dept. of Commerce. Shipments for the first six months of 1989 amounted to 1.206 billion pounds.

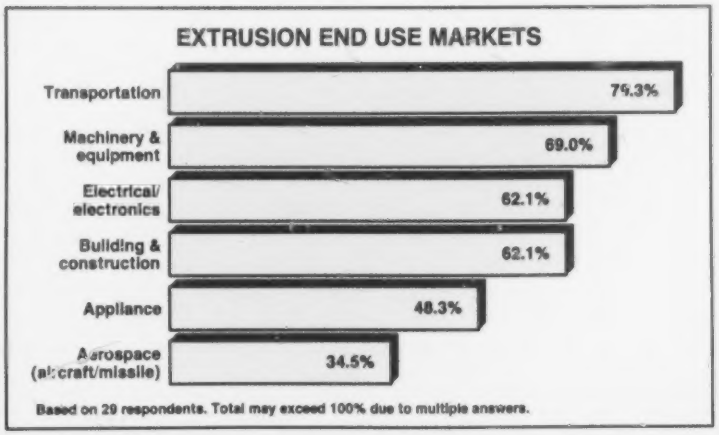
Total end-use shipments of aluminum extrusions reported by the Aluminum Extruders Council (AEC) for the second quarter of 1989 were up 12.7% from the previous quarter. Notable increases were seen in secondary doors and windows; mobile homes; curtain wall; store front and entrance doors; and the bridge/street/highway segments of the building and construction market. Other end-use sectors posting second quarter gains include the travel trailer/recreational vehicle segment of the transportation market; and the refrigerators/freezers segment of the consumer durables market.

One of the greatest concerns to extruders in recent years has been the drastic fluctuation of aluminum prices. The lack of price stability has made it very difficult for extruders to maintain their competitiveness. In the Guest Editorial in this issue, Richard W. Ziehm, president of Precision Extrusions, Inc. and chairman of the AEC points out that the aluminum price roller-coaster over the last few years has "led customers to seek materials whose prices are more consistent." As another extruder put it, "Losses in market share due to short term price uncompetitiveness are not easily won back in the short term, even if aluminum prices fall to parity."

But all is not gloom and doom for the industry. Fully 65.5% of the extruders who responded to PRECISION METAL's survey see business as being the same or better than one year ago.






EXTRUSION END USE MARKETS
Transportation 79.3%
Machinery & equipment 69.0%
Electrical/ electronics 62.1%
Building & construction 62.1%
Appliance 48.3%
Aerospace (aircraft/missile) 34.5%
Based on 29 respondents. Total may exceed 100% due to multiple answers.

Shipments of Aluminum Extruded Shapes

Year	Millions of Pounds
1981	1,803
1982	1,703
1983	1,915
1984	2,227
1985	2,353
1986	2,458
1987	2,482
1988	2,423
1989: First 6 Months	1,206

Source: U.S. Department of Commerce.

PRODUCER PRICE INDEX FOR ALUMINUM EXTRUSION BILLET (June 1980 = 100.0)

Year	Price Index
1981	111.8
1982	101.7
1983	107.6
1984	111.5
1985	105.0
1986	110.0
1987	119.0
1988	169.0
1989: January	(NA)
February	(NA)
March	(NA)
April	(NA)
May	161.8
June	162.8
July	(NA)
August	131.9

(NA): Not available. The producer price index for aluminum extrusion billet hit a peak in December 1988, when it reached 183.3.
Source: U.S. Department of Labor.

STATE OF THE INDUSTRY

1989/90

Opportunities for the future seem to depend on the extruder's willingness and ability to reduce unit costs by utilizing computers for design, manufacturing and process control. Providing value-added services is becoming increasingly necessary to benefit both the extruder and the customer.

Yet to be fully evaluated are new alloys and materials such as aluminum-lithium alloys and metal-matrix composites. Analysts have speculated that the aerospace market for extruded aluminum-lithium products could reach four million pounds as the need for light, high strength-to-weight ratio materials becomes more critical.

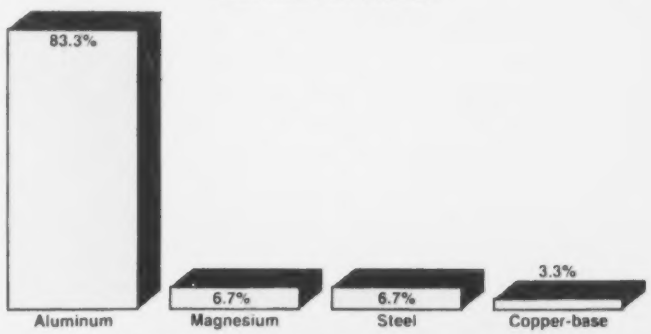
John Bridgeman, of the Extrusion Div. of British Alcan Aluminum plc, summarizes extrusion industry strengths, including the ability to demonstrate high levels of innovation in product design, willingness to understand and respond to customer needs, and interest in design and manufacturing technology developments. "But [while] our industry clearly enjoys other strengths," explains Bridgeman, "I am sure that none will be as important as our ability to innovate, in facing the challenges of the 1990s."

How many extruded products shipped will be shipped?

	1988	1989
Less than 1,000,000 lbs.	17.2%	24.1%
1,000,00 to 4,999,999 lbs.	24.1	17.2
5,000,000 to 9,999,999 lbs.	6.9	6.9
10,000,000 to 20,000,000 lbs.	27.6	24.1
Over 20,000,000 lbs.	24.1	27.6

Based on 29 respondents.

METALS EXTRUDED



Based on 30 respondents. Total may exceed 100% due to multiple answers.

About our survey...

PRECISION METAL surveyed a sizable portion of corporate officers and technical directors involved in the extrusion industry to gauge what changes have occurred this year and what are likely to occur during 1990.

A net mailing to 409 independent and captive extrusion plants in the United States and Canada resulted in a 13.4% rate of questionnaire return.

Our respondents claimed 80.4% of their extrusion is dedicated to independent work, while 19.6% is dedicated to captive work. These figures are based on percentage of extrusion operations only.

The color graphics pictured throughout this section offer more details as to who answered our survey, how their business is doing, and what they see ahead for their companies and the industry as a whole.

EXTRUSION PRESSES

Presses (size rating in tons)	Total Number of Presses	Number of Presses Within Each Age Category			1989 Number of Presses to be...			1990 Number of Presses to be...		
		Less than 10 years old	10 to 20 years old	More than 20 years old	Replaced	Rebuilt	Added Capacity	Replaced	Rebuilt	Added Capacity
Under 1,000	28	3	10	5	-	2	1	-	2	-
1,000 to 3,000	66	11	18	24	-	6	2	-	3	-
3,001 to 5,000	12	2	2	5	-	1	-	-	1	-
5,000 to 7,000	3	-	2	1	-	-	-	-	-	1
Over 7,000	5	-	2	2	-	-	-	-	-	-

Based on 28 respondents. Sum of age category may not equal total number of machines due to unknown age of machines.

STATE OF THE INDUSTRY

1989/90

FORGING

"Foreign competitors are diminishing in volume and increasing prices. They should be gone by 1995 if steel suppliers are more cooperative in both quality and service, and maintain pricing," says one of the respondents in PRECISION METAL's annual State of the Industry survey.

While not all forgers share this view, the statement reflects the underlying optimism of an industry on the rebound.

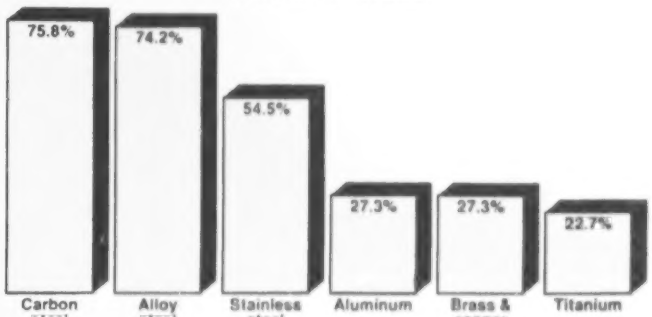
Business conditions look brighter this year for the forging industry. Fully 55.4% of the forging company officers who completed our survey say that their forging business is doing better this year than last. Only 10.8% say that 1989 looks to be somewhat worse than 1988.

In a Bureau of Labor Statistics (BLS) report issued recently, government economists look for 1989 forging output to increase 0.7% over 1988. Output for next year is expected to grow another 0.6%. In fact BLS moderate scenario projections forecast a long term period of slow, sustained growth with the average annual rate of change in forging output increasing at a rate of 0.9%, reaching $4.224 billion (in 1982 constant dollars) by 1995, and $4.463 by the year 2000.

"Old equipment"..."Should be modernized"..."have initiated projects to automate our hot forge operation." These survey comments reflect the pressure domestic forgers are facing to modernize their operations in order to increase their competitiveness. As energy and raw material costs in-

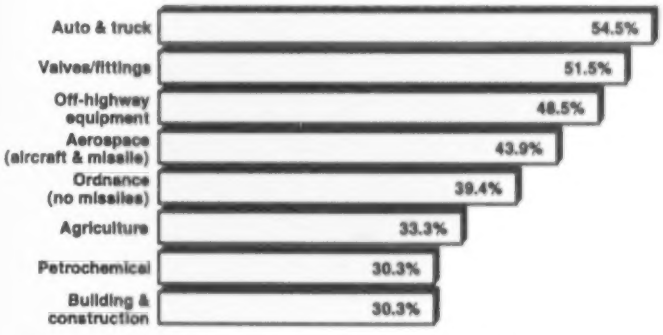
continued on page 30

METALS FORGED



Based on 66 respondents. Total may exceed 100% due to multiple answers.

FORGING END USE MARKETS



Based on 66 respondents. Total may exceed 100% due to multiple answers.

FORGING HAMMERS

Hammers (by lb mass of ram)	Total Number of Hammers	Number of Hammers Within Each Age Category			1989 Number of Hammers to be...			1990 Number of Hammers to be...		
		Less than 10 years old	10 to 20 years old	More than 20 years old	Replaced	Rebuilt	Added Capacity	Replaced	Rebuilt	Added Capacity
Less than 1,000	28	-	-	21	1	7	-	-	7	1
1,000 to 5,000	194	18	32	82	-	83	2	81	17	8
5,001 to 10,000	28	-	4	15	-	2	-	-	1	-
10,001 to 25,000	188	-	-	14	28	28	2	21	2	70
Over 25,000	84	-	-	2	-	20	-	-	3	-

Based on 37 respondents. Sum of age category may not equal total number of machines due to unknown age of machines.

STATE OF THE INDUSTRY

1989/90

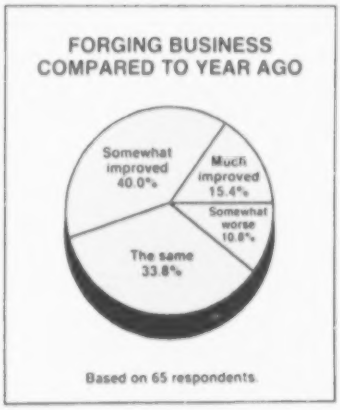
continued from page 26

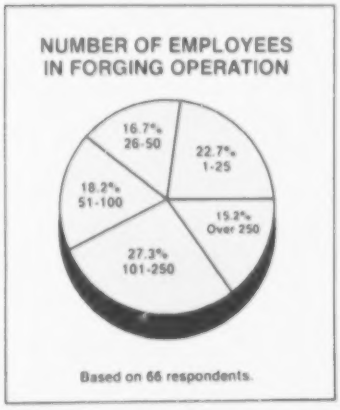
crease, more and more forgers are realizing that it is becoming increasingly important to utilize new equipment and/or rebuild or retrofit old equipment in order to take advantage of modern, energy-efficient press drive systems and integrated material handling.

Forgers are also finding end-users becoming more demanding, insisting on delivery of products with "value-added" features included. As one forger put it, "There is a trend toward more demanding machining prior to delivery, providing closer tolerances and better finishes."

Forging Industry Association technical director, H. James Henning explains, "Forging companies that want to experience growth in the tough competitive environment that lies ahead will have no choice but to move further and further into automatic and/or computerized production techniques and to combine some increasing levels of value-added steps."

New alloyed materials and improved strand-cast steels are helping forgers deliver higher quality parts with improved performance. Promising materials, many of which are still in various stages of development and thus, require careful evaluation, include: a relatively new





HYDRAULIC FORGING PRESSES

Hydraulic Presses (by tons force rating)	Total Number of Presses	Number of Presses Within Each Age Category			1989 Number of Presses to be...			1990 Number of Presses to be...		
		Less than 10 years old	10 to 20 years old	More than 20 years old	Replaced	Rebuilt	Added Capacity	Replaced	Rebuilt	Added Capacity
100 to 500	23	2	4	10	-	-	-	2	2	-
501 to 1,000	23	2	3	5	-	-	-	-	3	1
1,001 to 2,000	26	4	1	9	-	4	-	-	4	-
2,001 to 5,000	25	2	5	11	2	5	-	1	5	1
5,001 to 10,000	11	2	1	3	-	2	-	-	2	-
Over 10,000	10	1	1	2	1	-	-	-	1	1

Based on 25 respondents. Sum of age category may not equal total number of machines due to unknown age of machines.

MECHANICAL FORGING PRESSES

Mechanical Presses (by tons force rating)	Total Number of Presses	Number of Presses Within Each Age Category			1989 Number of Presses to be...			1990 Number of Presses to be...		
		Less than 10 years old	10 to 20 years old	More than 20 years old	Replaced	Rebuilt	Added Capacity	Replaced	Rebuilt	Added Capacity
100 to 500	89	15	9	52	-	1	1	1	-	5
501 to 1,000	61	9	12	13	-	4	-	-	3	-
1,001 to 2,000	40	6	7	11	-	7	1	5	2	1
2,001 to 5,000	30	5	5	12	-	7	-	1	4	-
5,001 to 10,000	6	-	1	1	-	2	-	1	-	-
Over 10,000	3	-	-	-	-	1	-	1	-	-

Based on 33 respondents. Sum of age category may not equal total number of machines due to unknown age of machines.

STATE OF THE INDUSTRY

1989/90

near-beta titanium alloy for aerospace structural components; aluminum-lithium (Al-Li) for high strength/weight ratio applications; titanium aluminides with elevated-temperature performance of nickel-based superalloys; metal-matrix composites (MMC) for fatigue resistance and strength/density ratios; and new micro-alloyed steels with dramatically improved impact toughness.

Along with the development of forging equipment and materials, as they face the 1990s forgers are realizing that the old maxim expressed so well by one of our survey respondents is still true. *"Quality is the key sales tool."*

How many forged components shipped will be shipped?

	1988	1989
Less than 1,000 tons	20.6%	20.6%
1,000 to 4,999 tons	33.3	27.0
5,000 to 10,000 tons	20.6	22.2
Over 10,000 tons	25.4	30.2

Based on 63 respondents

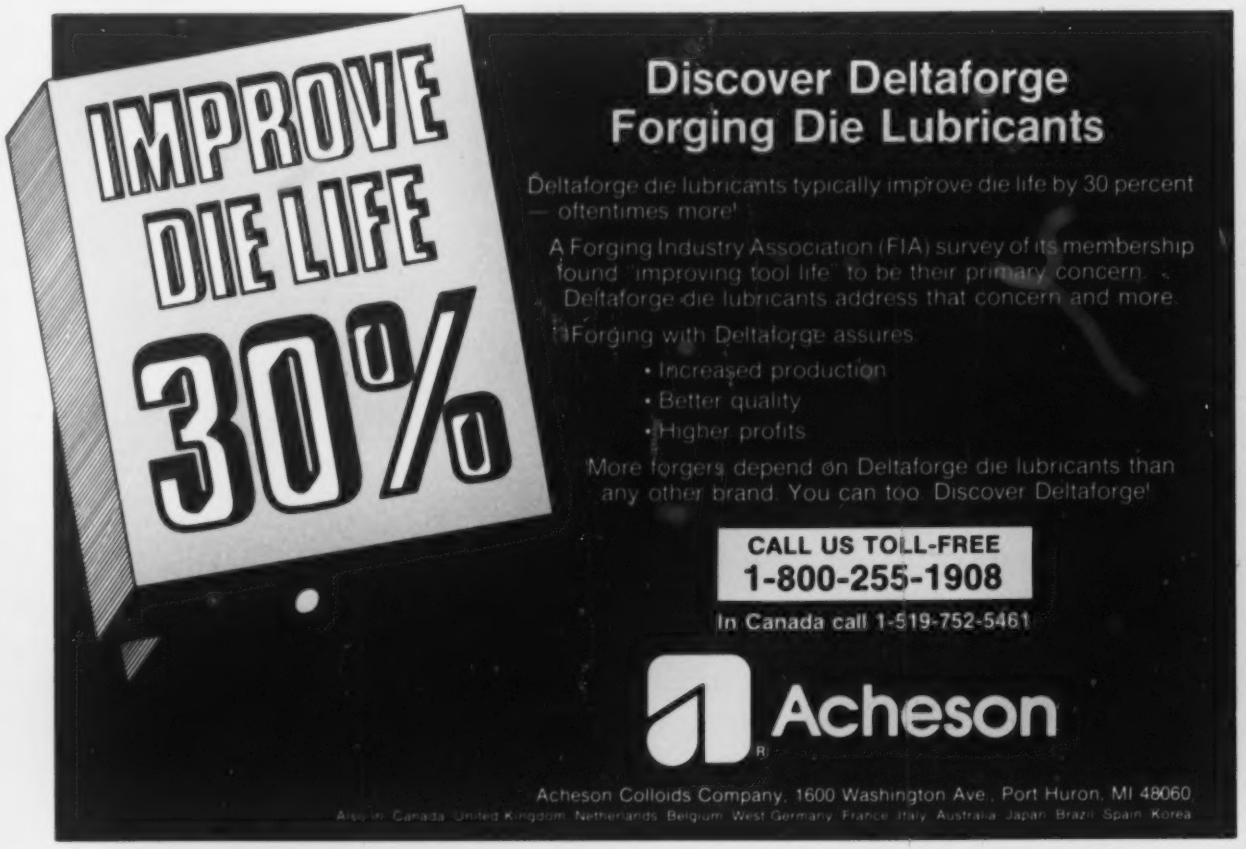
About our survey...

PRECISION METAL surveyed a sizable portion of corporate officers and technical directors involved in the forging industry to gauge what changes have occurred this year and what are likely to occur during 1990.

A net mailing to 461 independent and captive forging plants in the United States and Canada resulted in a 18.7% rate of questionnaire return.

Our respondents claimed 68.2% of their forging is dedicated to independent work, while 31.8% is dedicated to captive work. These figures are based on percentage of forging operations only.

The color graphics pictured throughout this section offer more details as to who answered our survey, how their business is doing, and what they see ahead for their companies and the industry as a whole.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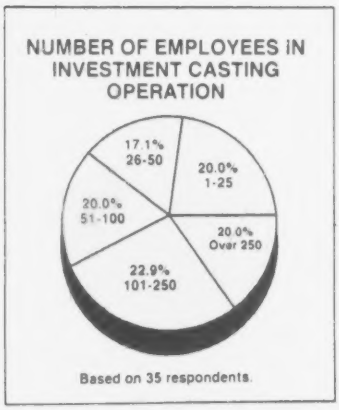
Circle 1

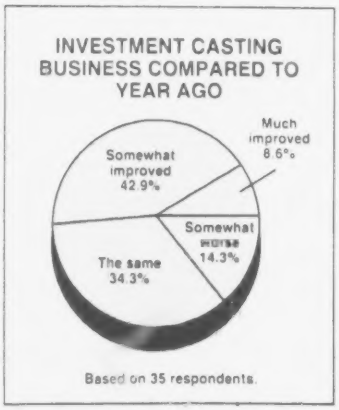
STATE OF THE INDUSTRY

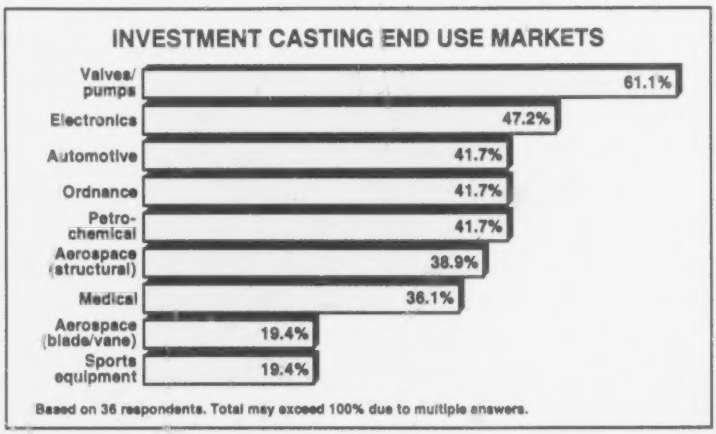
1989/90

INVESTMENT CASTING

"Healthy" may be a conservative way to describe the overall state of the investment casting industry.







Following a solid year of growth, in which the Investment Casting Institute (ICI) reports investment casting shipments in 1988 exceeded 1987 figures by 1.1% for the aerospace sector and as much as 35% for the commercial segment, the industry seems confident about the outlook for 1989. Almost 86% of the investment casting company executives responding to PRECISION METAL's State of the Industry survey say that their investment casting business is doing the same or better in 1989 compared to one year ago.

At the ICI's annual "How's Business Roundtable", reports the Institute, participating investment casters predicted a 13% increase in commercial and 0.4% increase in aerospace shipments for 1989. Capacity utilization figures for 1989 were estimated to be about 72% for aerospace casters and 73% for commercial companies.

Overall, according to the ICI, sales dollars have increased about 12% per year for the last three years, and indications are that they may increase as much as 20% next year.

According to industrial study #275 Industrial Castings, released recently by The Freedonia Group, Inc., shipments of steel investment castings are projected to rise rapidly. Non-

INVESTMENT CASTING WAX INJECTORS/EXTRUDERS

	Total Number of Machines	Number of Machines Within Each Age Category			1989 Number of Machines to be...			1990 Number of Machines to be...		
		Less than 10 years old	10 to 20 years old	More than 20 years old	Replaced	Rebuilt	Added Capacity	Replaced	Rebuilt	Added Capacity
Wax injectors	347	104	91	29	10	14	8	9	12	4
Wax extruders	46	12	17	5	1	1	2	1	3	3

Based on 30 respondents. Sum of age category may not equal total number of machines due to unknown age of machines.

defense market shipments will grow at a rate above defense shipments to 1993 as defense procurement declines and the recovery in U.S. durable goods manufacturing continues. [The complete 120-page study is available at $1800 from The Freedonia Group, Inc., 20600 Chagrin Blvd., Cleveland, OH 44122]

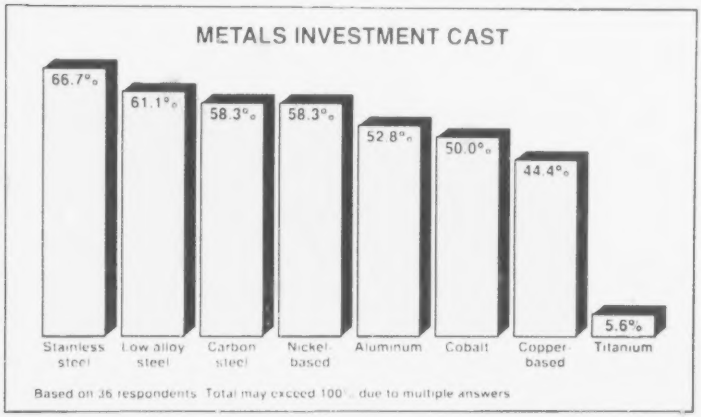
What must be kept in perspective is the relationship between the two major segments of the investment casting market. As Thierry Thys of Precision Founders, Inc. explains, "Since turbine engines are such a large segment of the industry, [the relative flatness of that market] has masked the parallel growth of the commercial and non-turbine business."

Even success has its challenges. "We are having growing pains," lamented one caster on his survey form. Another respondent said that they were expanding their 1982 building by 30%.

Perhaps the most insightful comment was made by a third investment caster about the importance of end-use market diversity and 'growing smart'. "As a small shop experiencing rapid growth, our challenges as we head into the 1990s will be to expand capacity wisely and broaden our industry base."

Large companies, especially in the aerospace sector, are being challenge to develop more parts from new alloys. As one investment caster describes it, "The process takes a great deal of expense and energy with minimal payback in the beginning, but it is necessary in order to remain on the leading edge — a leading edge that is constantly being pushed further."

Two recent developments that seem to offer a great deal of potential for investment casters are stereolithography and laminated object manufacturing. Both of these processes utilize laser technology and are capable of producing prototypes rapidly. Several companies are working on developing resins that can be used in place of wax patterns.



How many investment cast components shipped/ will be shipped?

	1988	1989
Less than 10,000 lbs.	16.7%	17.9%
10,000 to 49,999 lbs.	16.7	7.1
50,000 to 99,999 lbs.	20.0	21.4
100,000 to 499,999 lbs.	13.3	14.3
500,000 to 1,000,000 lbs.	6.7	10.7
Over 1,000,000 lbs.	26.7	28.6

Based on 29 respondents.

About our survey...

PRECISION METAL surveyed a sizable portion of corporate officers and technical directors involved in the investment casting industry to gauge what changes have occurred this year and what are likely to occur during 1990.

A net mailing to 347 independent and captive investment casting plants in the United States and Canada resulted in a 15.9% rate of questionnaire return.

Our respondents claimed 80.6% of their investment casting is dedicated to independent work, while 19.4% is dedicated to captive work. These figures are based on percentage of investment casting operations only.

The color graphics pictured throughout this section offer more details as to who answered our survey, how their business is doing, and what they see ahead for their companies and the industry as a whole.

STATE OF THE INDUSTRY

1989/90

POWDER METALLURGY

"United States P/M parts fabricators last year ran almost full tilt, straining to meet customer demand," says Donald G. White, executive director of the Metal Powder Industries Federation (MPIF) and American Powder Metallurgy Institute (APMI). "At the end of 1988, most were optimistic about good business levels through the first half of 1989. Their optimism has proved correct."

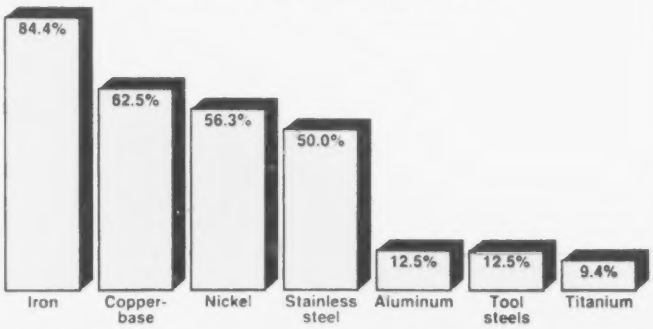
Results of PRECISION METAL's State of the Industry survey support Mr. White's assertion. Of the P/M company executives responding to our questionnaire, over 50% view their business as improved in 1989 over the previous year and almost 94% at least the same or better than 1988.

How many powder metal parts shipped will be shipped?

	1988	1989
Less than 100,000 lbs.	29.0%	29.0%
100,00 to 499,999 lbs.	6.5	6.5
500,000 to 999,999 lbs.	12.9	9.7
1,000,000 to 5,000,000 lbs.	41.9	45.2
Over 5,000,000 lbs.	\9.7	9.7

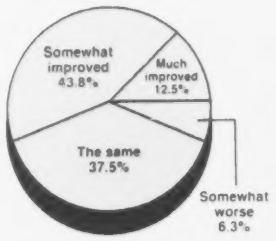
Based on 31 respondents.

METAL POWDERS PROCESSED



Based on 32 respondents. Total may exceed 100% due to multiple answers.

POWDER METAL BUSINESS COMPARED TO YEAR AGO



Based on 32 respondents.

POWDER METALLURGY COMPACTING PRESSES

Compacting Presses	Total Number of Machines	Number of Presses Within Each Age Category			1989 Number of Presses to be...			1990 Number of Presses to be...		
		Less than 10 years old	10 to 20 years old	More than 20 years old	Replaced	Rebuilt	Added Capacity	Replaced	Rebuilt	Added Capacity
Mechanical	423	77	183	128	1	19	11	8	25	19
Hydraulic	111	8	43	15	-	9	3	-	3	1

Based on 29 respondents. Sum of age category may not equal total number of machines due to unknown age of machines.

POWDER METALLURGY SINTERING FURNACES

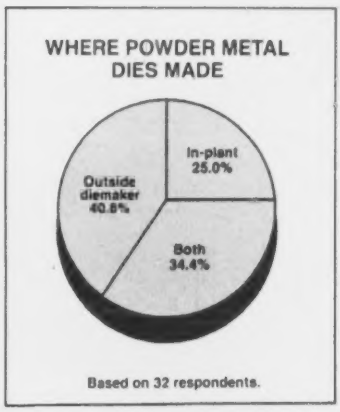
Sintering Furnaces	Total Number of Furnaces	Number of Furnaces Within Each Age Category			1989 Number of Furnaces to be...			1990 Number of Furnaces to be...		
		Less than 10 years old	10 to 20 years old	More than 20 years old	Replaced	Rebuilt	Added Capacity	Replaced	Rebuilt	Added Capacity
Electric	89	33	25	14	1	5	3	1	5	8
Fuel-fired	61	10	32	10	-	7	-	-	8	5

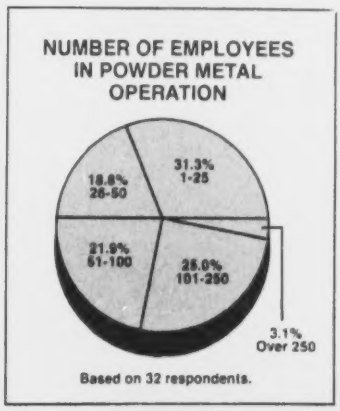
Based on 31 respondents. Sum of age category may not equal total number of machines due to unknown age of machines.

According to figures released by the MPIF, after posting an 8.9% increase in 1988 over 1987, iron powder shipments for the first four months of 1989 were up about 2% above the same period last year. A similar increase has been seen in the P/M parts sector.

Due to the economic climate, some P/M parts producers see a softening in demand for the end of 1989 into 1990. Others are more optimistic. As one survey respondent put it, "While the economy is not as robust as 1988, we put new projects put into place in 1989 that will drive growth at the company in 1990."

In response to demands of their customers, more and more P/M part producers are continuing to turn to statistical process control and 100% inspection. Equipment manufacturers are developing P/M process equipment such as microcomputer controlled compacting presses and furnace that are more efficient and promise to help the part producers maintain better control over their process, assuring





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STATE OF THE INDUSTRY

1989/90

higher quality and more consistent parts.

Aerospace and automotive markets are continuing to show increased interest in powder metal parts. Production of P/M steel connecting rods for Ford's 1.9 liter engine surpassed the 5.5 million mark early this year. The automaker has also decided to use 2% copper P/M hot forged steel connecting rods for its new V-8 modular engine to be introduced in the 1991 model year. Other new P/M parts for that modular engine include: two cam sprockets, two crank sprockets, a spacer, valve seats and guides and an oil pump gerotor.

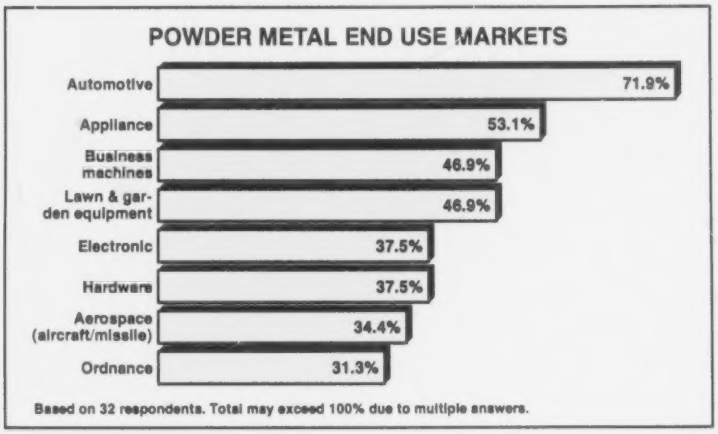
As to the future of P/M White says, "Looking ahead, there will be a growing interest in high-density P/M processing for parts requiring mechanical properties higher than available with conventional processing, but below the full-density properties of P/M forgings."

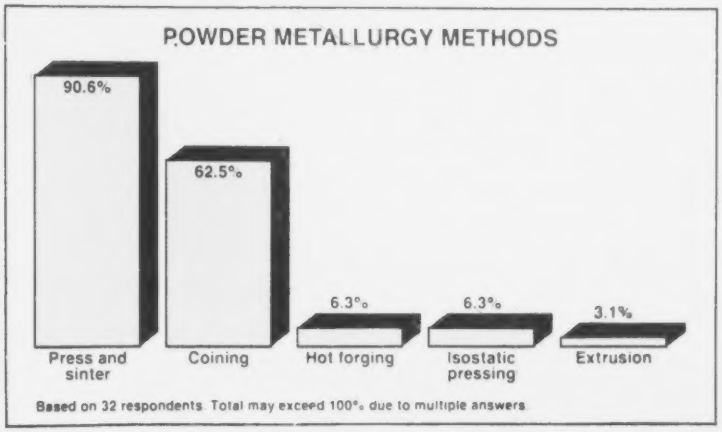
Important P/M processes and products that should begin to establish their full commercial potential in the next decade include P/M forging, metal injection molding, rapidly solidified materials, metal matrix composites, superalloys and tool steels.

North American Metal Powder Shipments
(1000's of tons)

	1986	1987	1988
Iron & Steel	204.0	217.6	236.9
Stainless Steel	3.3	3.4	3.2
Copper and copper base	17.6	19.3	22.0
Aluminum	32.1	30.0	25.9
Molybdenum	2.1	2.0 (E)	2.0 (E)
Tungsten	1.9	2.0	2.3
Tungsten carbide	1.4	4.0	5.0
Nickel	10.3	11.0	10.8
Tin	1.0	1.0	1.1
(E) Estimate Total	273.7	290.3	309.2

Source: Metal Powder Industries Federation





About our survey...

PRECISION METAL surveyed a sizable portion of corporate officers and technical directors involved in the powder metal industry to gauge what changes have occurred this year and what are likely to occur during 1990.

A net mailing to 341 independent and captive powder metal part production plants in the United States and Canada resulted in a 15.2% rate of questionnaire return.

Our respondents claimed 74.8% of their P/M part production is dedicated to independent work, while 25.2% is dedicated to captive work. These figures are based on percentage of P/M operations only.

The color graphics pictured throughout this section offer more details as to who answered our survey, how their business is doing, and what they see ahead for their companies and the industry as a whole.

STATE OF THE INDUSTRY

1989/90

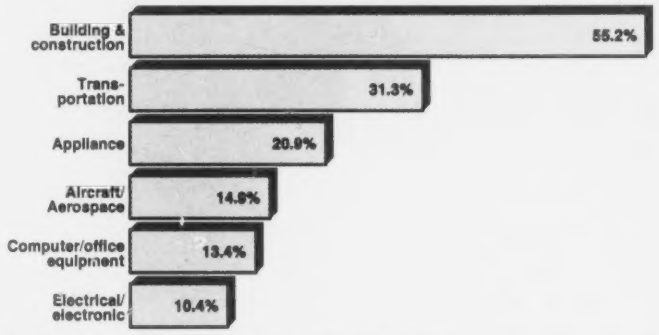
ROLL FORMING

Although responses varied to some degree, year-to-date shipments of Custom Roll Forming Institute (CRFI) members averaged about 2 to 3% higher than October, 1988. However, many members cautioned that figures reflect the common end-of-year downswing and therefore believe early 1990 business will show even greater growth. Some of the members cited a better 1990 based on increased job quoting.

Our survey seems to reflect these trends as most custom and captive roll formers predicted a average or better than average 1990.

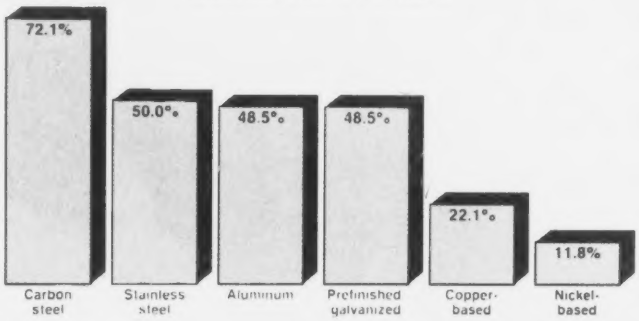
A common thread that runs throughout most metalworking businesses in 1989 is the shortage of skilled laborers. This problem is certainly no stranger to roll formers, as most have indicated that it is their major concern at present.

ROLL FORMING END USE MARKETS



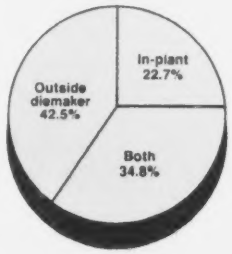
Based on 67 respondents. Total may exceed 100% due to multiple answers.

METALS ROLL FORMED



Based on 68 respondents. Total may exceed 100% due to multiple answers.

WHERE ROLL FORMING DIES MADE



Based on 66 respondents.

ROLL FORMING MACHINES

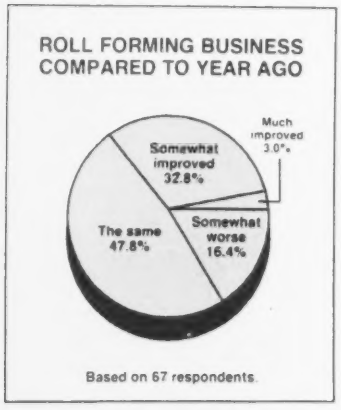
Roll Forming Machines (by number of roll stations)	Total Number of Machines	Number of Machines Within Each Age Category			1989 Number of Machines to be...			1990 Number of Machines to be...		
		Less than 10 years old	10 to 20 years old	More than 20 years old	Replaced	Rebuilt	Added Capacity	Replaced	Rebuilt	Added Capacity
2 to4	54	7	13	20	1	1	-	1	1	1
5 to 8	175	46	88	25	-	41	4	4	42	1
9 to 12	228	63	84	59	-	19	12	1	15	16
13 to 15	92	13	30	41	1	5	2	-	-	2
16 to 20	36	4	7	10	1	1	3	1	2	1
21 to 25	30	4	1	23	-	1	1	-	-	-
Over 25	70	5	17	47	-	3	5	-	6	-

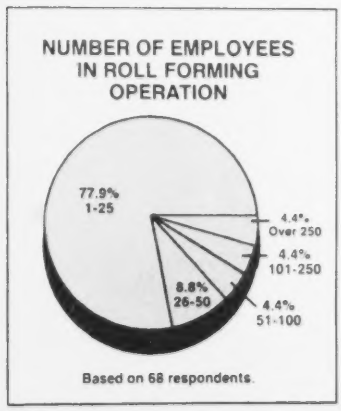
Based on 65 respondents. Sum of age category may not equal total number of machines due to unknown age of machines.

Raw material quality, supply and price has become less of a concern this year than in the past for both custom and captive roll formers. Specifically, quality and supply have improved in carbon and stainless steel while price has lowered, or at least, stabilized. However, availability and supply of special materials (primarily nonferrous) seems to be a growing problem while pricing continues to fluctuate.

SOURCE OF RAW MATERIAL FOR ROLL FORMING	
	Percent of Total Raw Materials
Mills	50.9%
Service centers	49.1

Based on 65 respondents.





How many roll formed shapes shipped/will be shipped?		
	1988	1989
Less than 100,000 lbs.	34.4%	32.8%
100,00 to 499,999 lbs.	15.6	17.2
500,000 to 999,999 lbs.	7.8	7.8
1,000,000 to 5,000,000 lbs.	14.1	14.1
Over 5,000,000 lbs.	28.1	28.1

Based on 64 respondents.

When Allied Automotive discovered CPM tool steel...

die life increased 300%

When it came to the type of tool steel used for the manufacture of Fram Filters, Allied Automotive, Greenville, Ohio, discovered that they "could pay a little now or a lot later."

Allied recently switched from D-2 steel to Crucible's CPM 10V for a die which produces parts for Fram oil filters. Dave Fritzinger, Allied senior manufacturing engineer, said, "Any additional expense due to the change was far outweighed by the increase in overall productivity, as tool life jumped 300%, from six months to two years."

Allied first used CPM 10V to replace a D-2 punch that was having an erosion problem and the problem went away. Now when new dies are constructed, CPM 10V is automatically specified.

Other CPM steel users enjoying productivity gains include Caterpillar, General Electric and Ford. To find out more about CPM tool steels, call your nearest Crucible Service Center or write: Crucible Service Centers, 5639 W. Genesee St., Camillus, NY 13031-0991.

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Circle 9

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Circle **18**

STATE OF THE INDUSTRY

1989/90

Roll formers are continuing to feel the demand for statistical process control procedures and just-in-time deliveries as more users require improved quality from their suppliers. This has produced a "scrambling" effect, as roll formers begin to implement or update these quality and inventory measures.

Overall, roll forming opportunities should continue to strengthen into the next decade, should the proper quality procedures be put into place. As one roll former optimistically noted in our survey, "We are looking for our roll forming operations to offset any declines in our other businesses in the 1990s."

About our survey...

PRECISION METAL surveyed a sizable portion of corporate officers and technical directors involved in the roll forming industry to gauge what changes have occurred this year and what are likely to occur during 1990.

A net mailing to 961 independent and captive roll forming plants in the United States and Canada resulted in a 15.6% rate of questionnaire return.

Our respondents claimed 44.7% of their roll forming is dedicated to independent work, while 55.3% is dedicated to captive work. These figures are based on percentage of roll forming operations only.

The color graphics pictured throughout this section offer more details as to who answered our survey, how their business is doing, and what they see ahead for their companies and the industry as a whole.

STAMPING

STATE OF THE INDUSTRY 1989/90

"The state of the metalforming industry is a mixture of good news and bad news," reports Jon E. Jenson, president of the Precision Metalforming Association (PMA). "In 1988, industry shipments were up about 18% over the previous year. Order bookings were up about the same. The industry backlog, after 2½ years of steady increase, is at an all-time high.

"This means that the short-term gains have been real, and that the increase in activity has not been stolen from the future," says Jenson.

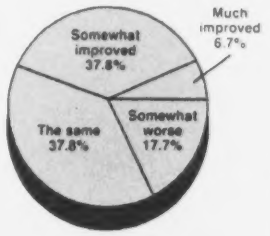
He cautions though that the longer term perspective is not as bright. After adjustment for inflation, net growth in real terms has been minimal over the last five years for the metalforming industry. "For example, material costs, as a proportion of total sales price, are creeping up," adds Jenson. "They've risen from an average of 30.8% in 1986, to 31.7% in 1987, and 33.1% in 1988.

"Average industry profits over the past 5 years have been within the narrow range of 2.5% to 4.8% net after taxes. In 1988, they were down slightly to 3.9%," continues Jenson.

Those stampers tied closely with the automotive industry project a "softening" in business for the end of 1989 and into 1990. "When they (domestic automobile producers) don't sell cars, obviously our volume automatically goes down," states a Midwestern producer of custom stamped parts.

For those stampers that are hoping to continue supplying automobile manufacturers, implementation of rigid quality controls is a must. "Some companies are swearing up and down that they aren't going to implement quality controls," says John Fischer, president of F&G Multi-Slide Inc., Franklin, OH. "In that case, this can only help us because we are keeping pace with required SPC and quality controls."

STAMPING BUSINESS COMPARED TO YEAR AGO



Based on 45 respondents.

MECHANICAL STAMPING PRESSES

Mechanical Presses (by tons force capacity)	Total Number of Presses	Number of Presses Within Each Age Category			1989 Number of Presses to be...			1990 Number of Presses to be...		
		Less than 10 years old	10 to 20 years old	More than 20 years old	Replaced	Rebuilt	Added Capacity	Replaced	Rebuilt	Added Capacity
1 to 10	112	8	34	25	1	-	-	-	-	-
11 to 50	401	10	123	93	5	25	-	7	24	2
51 to 100	279	7	79	87	8	9	3	8	13	1
101 to 500	231	12	44	47	2	4	6	-	3	3
Over 500	17	2	5	5	-	-	-	-	-	1

Based on 47 respondents. Sum of age category may not equal total number of machines due to unknown age of machines.

HYDRAULIC STAMPING PRESSES

Hydraulic Presses (by tons force capacity)	Total Number of Presses	Number of Presses Within Each Age Category			1989 Number of Presses to be...			1990 Number of Presses to be...		
		Less than 10 years old	10 to 20 years old	More than 20 years old	Replaced	Rebuilt	Added Capacity	Replaced	Rebuilt	Added Capacity
1 to 10	42	2	12	11	-	-	-	-	-	-
11 to 50	23	4	4	2	-	1	-	-	2	-
51 to 100	15	4	-	2	1	-	1	-	-	-
101 to 500	22	5	7	6	-	1	2	-	1	1
Over 500	-	-	-	-	-	-	-	-	-	-

Based on 25 respondents. Sum of age category may not equal total number of machines due to unknown age of machines.

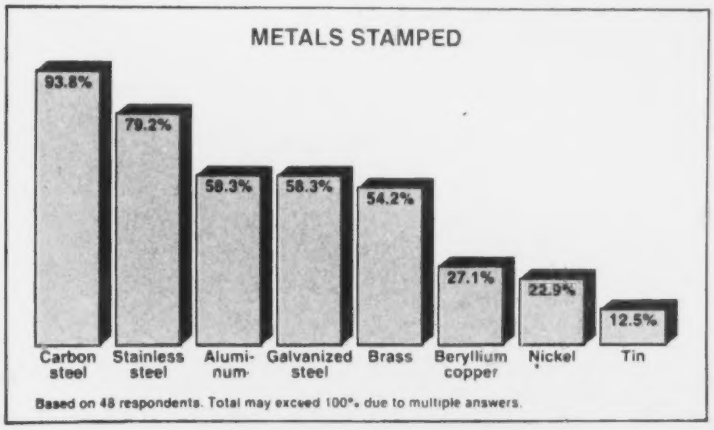
STATE OF THE INDUSTRY

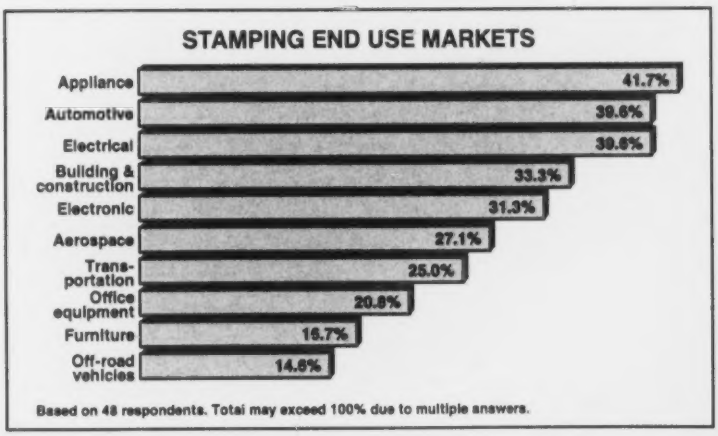
1989/90

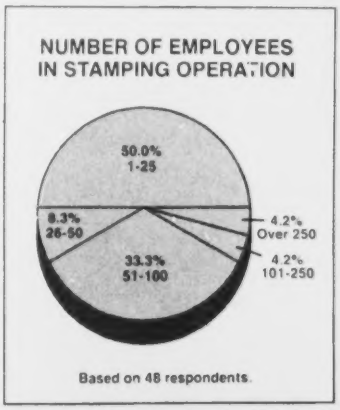
For those stampers seeking a way out of an automotive industry induced slump, diversification is the key. Electrical, electronic, appliance, and in some cases, defense applications, are growing industries many stampers are seeking.

Although many of the stampers we spoke with claim raw material quality, delivery and price is "loosening up" in late 1989, Voluntary Restraint Agreements (VRAs) (of shipments of raw material into the U.S.) continue to be a major concern for many stampers. President Bush recently extended VRA quotas for 2½ years, as opposed to the original 5 years of the first agreement—to expire on March 31, 1992. As of this writing, the new agreements have not yet been formalized.

A spokesman for the Coalition of American Steel Using Manufacturers believes terms will not change much from the original agreement which expired on September 30 of this year.







How many stamped parts shipped/will be shipped?

	1988	1989
Less than 100,000 lbs.	22.2%	20.5%
100,00 to 499,999 lbs.	22.2	18.2
500,000 to 999,999 lbs.	13.3	15.9
1,000,000 to 5,000,000 lbs.	24.4	27.3
Over 5,000,000 lbs.	17.8	18.2

Based on 45 respondents.

About our survey...

PRECISION METAL surveyed a sizable portion of corporate officers and technical directors involved in the stamping industry to gauge what changes have occurred this year and what are likely to occur during 1990.

A net mailing to 445 independent and captive stamping plants in the United States and Canada resulted in a 12.6% rate of questionnaire return.

Our respondents claimed 65.0% of their stamping is dedicated to independent work, while 35.0% is dedicated to captive work. These figures are based on percentage of stamping operations only.

The color graphics pictured throughout this section offer more details as to who answered our survey, how their business is doing, and what they see ahead for their companies and the industry as a whole.